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FINAL

US Army Corps of Engineers

Toxic and Hazardous Materials Agency

APPENDED TECHNICAL PLAN
APPENDED FIELD SAMPLING PLAN
APPENDED HEALTH AND SAFETY PLAN
APPENDED QUALITY ASSURANCE PROJECT PLAN

for the

RCRA Facility Investigation/Corrective Measures Study (RFI/CMS) and Base Closure Environmental Study for the Lexington-Blue Grass Army Depot

Submitted to:

Commander
Department of the Army
United States Army Toxic and Hazardous Material Agency
Aberdeen Proving Ground, Maryland

Submitted by:

Metcalf & Eddy, Inc.
2800 Corporate Exchange Drive
Suite 250
Columbus, Ohio 43231

Prepared Under:

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Task Order Number 4

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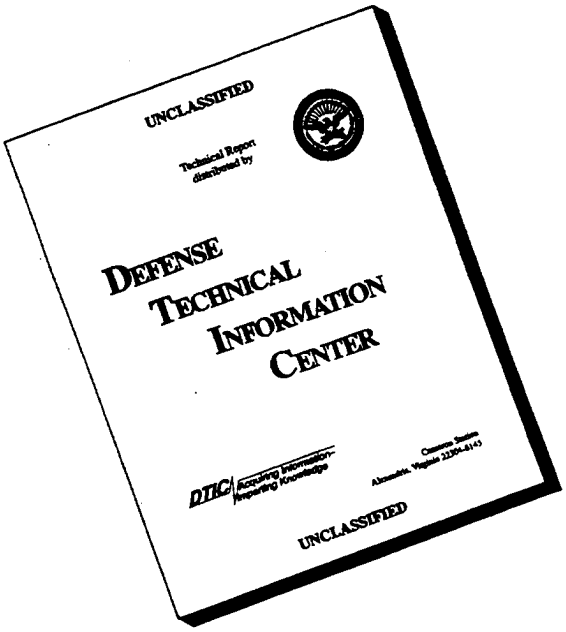

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INTRODUCTION

Metcalf & Eddy, Inc. (M&E) under contract with the United States Army Toxic and Hazardous Materials Agency (USATHAMA), contract number DAAA15-90-D-0016 Task Order Number 4, has appended the Technical Plan for the RFI/CMS for base closure at the Lexington-Blue Grass Army Depot, Kentucky. The appendix describes comments, addenda, corrections and clarifications to, *Task Order 1, Technical Plan, Lexington-Blue Grass Army Depot, Kentucky* (USATHAMA, 1991) henceforth called the "original document."

USEPA review comments of July 31, 1991, on the original document, have been incorporated into this appendix unless the comment suggested work outside the contracted scope of work for Task Order 4. Work outside the contracted scope will be conducted at a later date, as deemed necessary by the COR.

The proposed sampling program under Task Order 4 is shown in the following table, which is consistent with the revised Table 4-1.

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Sampling Program
at Lexington – Blue Grass Army Depot

Location	Old Landfill SWMU #4	ISWDL SWMU #'s 2,5,6,7	New Landfill SWMU #1	Area A Septic Tank	Area B (Drainage path near water tower)	Area C
Geo. Survey	Resistivity	Resistivity	Resistivity	EM Tank and Pipes	Resistivity	Resistivity
Trenching	4 Trenches 4 Samples				2 trenches 2 samples	1 trench 1 sample
Monitor Well Inst. & Devel.	5 wells	3 wells	6 wells			
Well Sampling and Water Levels	5 wells 7 samples	6 wells 8 samples	10 wells 12 samples			
Slug Tests	5	3	6			
Soil Sampling W/Hand Auger	10 locations 33 samples	3 ditches, 2/ditch 7 samples	3 locations 6 samples	3 locations 7 samples	6 locations 13 samples	2 locations 5 samples
Surface Water Sampling	4 locations 6 samples	4 locations 6 samples				
Sediment Sampling	4 locations 9 samples	4 locations 9 samples	6 locations 7 samples			4 locations 4 samples
Radiation Survey	During all activities	During all activities	During all activities			
Seeps	4	4	4			
Septic Tank Sampling				2 locations (1 tank, 1 sump) 4 samples		
Surface Soil Sampling w/Scoop				1 path 3 samples		
Lagoon Sed Sampling						
Lagoon Berm Boring						
Soil Gas						
Concrete Chip Sampling						
Wipe Samples						
Misc. Tasks						
Deep Soil Boring						
Plumbing Survey						

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Sampling Program
at Lexington – Blue Grass Army Depot

Location	Industrial Waste Lagoon (SWMU #3	Wood Pile/Fire Training Area (SWMU #24)	Building #135	Building #147	Building #221	Building #3	Building #10
Geo. Survey							
Trenching							
Monitor Well Inst. & Devel.	1 well						
Well Sampling and Water Levels	1 new well 3 existing 5 samples						
Slug Tests	1 new well						
Soil Sampling W/Hand Auger	8 locations 17 samples						
Surface Water Sampling	2 (1 each lagoon) 4 samples						
diment Sampling	6 locations 14 samples						
Radiation Survey							
Seeps	3						
Septic Tank Sampling			1 location 1 sample				
Surface Soil Sampling w/Scoop		6 locations 7 samples	1 location 1 sample		2 locations 3 samples		3 locations 3 samples
Lagoon Sed Sampling	6 locations 13						
Lagoon Berm Boring	4 locations 13						
Soil Gas		3 from grid	8 locations 8 samples	8 locations 8 samples		16 locations 16 samples	4 locations
Concrete Chip Sampling			5 locations 5 samples	4 locations 5 samples		5 locations 5 samples	1 location 1 sample
Wipe Samples					2 locations 7 samples		
Misc. Tasks							
ep Soil Boring							
Plumbing Survey							

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Sampling Program
at Lexington – Blue Grass Army Depot

Location	Building #19	Building #43	Building #63	Building #64	Building #107	Building #130	Building #134
Geo. Survey							
Trenching							
Monitor Well Inst. & Devel.							
Well Sampling and Water Levels							
Slug Tests							
Soil Sampling W/Hand Auger							
Surface Water Sampling							
Sediment Sampling							
Radiation Survey							
Seeps							
Septic Tank Sampling							
Surface Soil Sampling w/Scoop			2 location 4 samples	4 locations 4 samples		1 location 1 sample	
Lagoon Sed Sampling							
Lagoon Berm Boring							
Soil Gas	4 locations 4 samples	4 locations 4 samples	4 locations 4 samples		4 locations 4 samples	4 locations 4 samples	
Concrete Chip Sampling	1 location 1 sample		1 location 1 sample	2 locations 2 samples	1 location 1 sample	2 locations 2 samples	
Wipe Samples				1 location 2 samples		1 location 1 sample	
Misc. Tasks							Sink Inspect.
Deep Soil Boring							
Plumbing Survey							

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Sampling Program
at Lexington – Blue Grass Army Depot

Location	Building #140,141	Building #4,5,135,139 SWMU #23	Building #6	Sump Behind Building #139 SWMU #18,19	Wastewater Treatment SWMU #16,17,30	Building #16
Geo. Survey						
Trenching						
Monitor Well Inst. & Devel.						
Well Sampling and Water Levels						
Slug Tests						
Soil Sampling W/Hand Auger				4 locations 13 samples	6 locations 25 samples	
Surface Water Sampling						
Sediment Sampling					5 locations 6 samples	
Radiation Survey	A,B,G Survey	A,B,G Survey				
Seeps						
Septic Tank Sampling				1 location 1 sample	3 locations 5 samples	
Surface Soil Sampling w/Scoop				2 locations 2 samples		
Lagoon Sed Sampling						
Lagoon Berm Boring						
Soil Gas	8 locations (4 @ 2 bldgs.)					4 locations 4 samples
Concrete Chip Sampling		4 locations 12 samples				1 location 1 sample
Wipe Samples		4 locations 12 samples	3 locations 4 samples			
Misc. Tasks						
Deep Soil Boring						
Plumbing Survey						

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Sampling Program
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Location	Building #27	Building #42	Building #9,46 SWMU #20	Landing Field	Building #8 SWMU #25	Building #40 SWMU #11	Coal Pile/Heating Plant Area
Geo. Survey				EM Tank			
Trenching							
Monitor Well Inst. & Devel.							
Well Sampling and Water Levels							
Slug Tests							
Soil Sampling W/Hand Auger							4 locations 9 samples
Surface Water Sampling							
Sediment Sampling							
Radiation Survey							
Seeps							
Septic Tank Sampling			1 location 1 sample				
Surface Soil Sampling w/Scoop	2 locations 2 samples		3 locations 4 samples		2 locations 2 samples	3 locations 3 samples	
Lagoon Sed Sampling							
Lagoon Berm Boring							
Soil Gas	4 locations 4 samples	4 locations 4 samples	3 locations 3 samples	8 locations 8 samples			
Concrete Chip Sampling	6 locations 12 samples				6 locations 7 samples		1 location 1 sample
Wipe Samples						2 locations 2 samples	
Misc. Tasks							
Deep Soil Boring							
Plumbing Survey							

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Sampling Program
at Lexington – Blue Grass Army Depot

Location	Industrial Wastewater Treatment Plant; Sand Beds; Building #124	Building #45 AOC #1	Building #303	Radioactive Materials Storage Areas	Open Storage and Shelter Areas	DRMO Spill SWMU #12
Geo. Survey						
Trenching						
Monitor Well Inst. & Devel.						
Well Sampling and Water Levels						
Slug Tests						
Soil Sampling W/Hand Auger	4 locations 13 samples					
Surface Water Sampling						
ediment Sampling						
Radiation Survey				Bldgs. 103,128,139,14		
Seeps						
Septic Tank Sampling						
Surface Soil Sampling w/Scoop	3 locations 5 samples	2 locations 2 samples	2 locations 3 samples		11 locations 12 samples	6 locations 7 samples
Lagoon Sed Sampling						
Lagoon Berm Boring						
Soil Gas					12 locations (3 bldgs./areas)	
Concrete Chip Sampling						
Wipe Samples		2 locations 2 samples	2 locations 3 samples		2 locations 2 samples	
isc. Tasks						
eep Soil Boring	4 locations 6 samples					
Plumbing Survey						

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Sampling Program
at Lexington – Blue Grass Army Depot

Location	Transformer Spill Near Building #223	Water Supply Wells	Culverts SWMU #29	USTs	Facility-Wide	Background
Geo. Survey						
Trenching						
Monitor Well Inst. & Devel.						
Well Sampling and Water Levels		6 locations 8 samples				
Slug Tests						
Soil Sampling W/Hand Auger						7 locations 14 samples
Surface Water Sampling					32 locations 37 samples	
Sediment Sampling			5 locations 7 samples		32 locations 37 samples	
Radiation Survey						
Seeps						
Septic Tank Sampling						
Surface Soil Sampling w/Scoop	2 locations 2 samples					
Lagoon Sed Sampling						
Lagoon Berm Boring						
Soil Gas				3 locations 6 samples		
Concrete Chip Sampling						
Wipe Samples						
Misc. Tasks					Asbestos Survey	
Deep Soil Boring						
Plumbing Survey					20 locations 24 samples	

AMENDMENTS/CLARIFICATIONS/ADDITIONS TO THE TECHNICAL PLAN

Changes, amendments, additions and corrections to the document are listed below under the pertinent section.

Section 1.0. This section of the original plan is unchanged and applies as written except for the changes described below.

Section 1.0, Page 3, Paragraph 1, Lines 5-6.

Change: "All recommendations for additional investigation from the RFA have been incorporated into the strategy presented in this document."

Change to: Delete this sentence.

Section 2.0. This section of the original plan is unchanged and applies as written.

Sections 3.0-3.1. These sections of the original plan are unchanged and apply as written.

Section 3.2, Page 20, Paragraph 3, Lines 1-2.

Change: "The QAPjP has been designed to comply with the requirements of the 1987 USATHAMA QA Program."

Change to: The QAPjP has been designed to comply with the requirements of the 1987 USATHAMA QA Program and the USEPA Standard Operating Procedures and Quality Assurance Manual (USEPA, 1991), as appropriate.

Sections 3.2.1 - 3.5. These sections of the original plan are unchanged and apply as written.

Section 3.6.

Change: Delete existing section and insert the following:

3.6 Data Management and Evaluation

Proper data management during this RFI/CMS and base closure program at Lexington-Blue Grass Army Depot will facilitate reliable and defensible conclusions. Data collected from investigation activities will be evaluated and assessed to determine whether they meet project objectives, and will be used in making decisions as part of the RFI/CMS. The data will also be used to develop the contamination, human health, and environmental assessments. Identified contaminants will be evaluated with reference to appropriate standards and background levels and will be further evaluated regarding the sources and potential transport mechanisms.

3.6.1 Installation Restoration Data Management Information System (IRDMIS)

IRDMIS consists of a distributed network of IBM microcomputers, or their functional equivalents that allow the entry, verification, and output of chemical, geotechnical, and map data, in support of the USATHAMA Installation Restoration Program (IRP). The Contractor and the USATHAMA-approved laboratory will be supplied with the appropriate microcomputer-based software to allow record entry, error checking, and quality control for chemical, geotechnical, and map data. Data records will be transmitted to a data storage and handling system centrally located at USATHAMA's Edgewood, Maryland, facility. Subsequent processing at the central site (duplicate error check) will result in an elevation of the accepted records to a higher file "level".

3.6.1.1 Data Management Scheme. There are three levels of data in the IRDMIS. Level 1 consists of all files on the contractor's microcomputer that have been entered or generated by the error checking program. Once data have been entered into PCTOOL, they will be checked and then archived into a transfer file and transmitted to Potomac Research, Inc. (PRI).

The Contractor's terminal will be linked to the network using software supplied by USATHAMA and a Hayes modem. If the software is not supplied by USATHAMA, the files will be sent on a floppy disk to USATHAMA via mail. Terminal usage logs will be established and maintained as a permanent record of communications. Each Monday, PRI will send a telefax to the Contractor listing the files received and the acceptance status. To verify acceptance, PRI will process each file through an error checking program. Accepted files will be sent to the UNISYS mainframe. Should any files fail this final error check, the Contractor will be notified and required to correct detected errors and retransmit the data.

A USATHAMA-certified laboratory will be used for chemical sample analysis and will be responsible for entering chemical analytical results. The Contractor will be responsible for entering data into IRDMIS geotechnical and map files. The Contractor will be responsible for performing error checking, correction, and transmitting Level 1 files to USATHAMA.

After the USATHAMA Chemistry Branch has reviewed and approved the data control charts, the files will be classified as Level 2 files. Level 2 files will exist only until the data are loaded into the USATHAMA data base; normally within 10 working days.

Data in the USATHAMA data base are considered Level 3 data. They may be accessed using USATHAMA-supplied report programs via password security under UNIX; however, the data files are protected from changes by a "read only" key.

3.6.2 Project Data

Data that are generated during this project will consist of geotechnical data and sample/analytical data. The types, origin, IRDMIS files, and handling of these data are described below.

3.6.2.1 Geotechnical Data. The Contractor will be responsible for all geotechnical data entry. All appropriate data will be entered in the field or from the Contractor's office in order to achieve data submittal deadlines. Data files will be submitted to the IRDMIS system within the time frames shown on Table 3-4.

These files are generated from field logbooks, boring logs, and field parameter forms used by the site investigators. The data are entered and a computer printout of the file is checked and corrected by the site investigator. The contractor will be responsible for inputting the map file information (recorded by the site geologist on field parameter forms) which will be checked and corrected by the site geologist.

All data (including data not entered into the IRDMIS) will be logged into notebooks, then packaged with any hard-copy outputs (e.g., plots, charts), and sent to the contractor's data controller (DC). Both the DC and the QA Coordinator will review these data, referred to as field data, before the DC archives the information for future reference.

3.6.2.2 Sample Codes. Field samples, taken for laboratory analysis, require a unique identification code for site identification (10 characters) and field sample number (8 characters). The site identification is arranged in a general to specific format, from left to right within the identification number. The following code system will be used for site identification:

SSA#MTM#XX

where:

- S is an abbreviation for the sampled area. The abbreviations to be used are **S** for SWMU, **B** for Building, **A** for Area of Concern, **W** for Water Supply Well, **L** for Landing Field, **U** for Underground Storage Tank, **T** for Storage Area, and **D** for Decontamination Water. These abbreviations are listed in order of precedence for any area characterized by more than one designation.

- SA# is the designated number for the sampled area. This number has been assigned by USATHAMA, and is listed in the Technical Plan. For example, for Building 302, SA# is 302.

- MT is an abbreviation for the sample type. The abbreviations to be used are **AS** for asbestos, **SD** for sediment, **SA** for soil auger, **SO** for soil boring, **MW** for monitoring well, **SW** for surface water, **SS** for surface soil, **WP** for wipe, **TB** for trip blank, **DW** for decontamination water, **TP** for tap water, **CC** for concrete chip, **SB** for soil blank, **ER** for equipment rinsate, **FB** for field blank, and **FD** for field duplicate.

- M# is an abbreviation for the media type number, at each sampled area. This will distinguish between multiple samples of the same media at one sampled area. For example, at Building 302 four wipe samples will be collected. These are designated WP01, WP02, WP03, and WP04. M# is 01, 02, 03, and 04, respectively.

- XX is an abbreviation for the discrete sampled interval. The number indicates the depth, in feet from which the sample was collected. Sample intervals will be designated as the top of the interval.

The field sample number will be uniquely assigned to each sample, in ascending order, starting at 0001.

3.6.2.3 Sample Forms. Sampling data will be collected in the field in a permanently bound logbook or on boring logs and well construction diagrams as shown in Figures 3-1 and 3-2, respectively. For IRDMIS data entry, information from the log books, boring logs, and well construction diagrams will be entered onto one or more data entry forms as described in this section.

In addition, each sample container will be labeled in waterproof ink or with waterproof labels with the installation name, sample number, sampling date, method number, analytes, and preservatives. A chain-of-custody form as shown in Figure 3-3 will also be completed in the field and will accompany the samples to the laboratory. The chain of custody form shown in Figure 3-3 contains both the information needed to ensure that sample custody is maintained and the information needed by the laboratory for IRDMIS entry. If a more conventional chain of custody form is used in place of the one shown in Figure 6-3, the IRDMIS information will be supplied on a separate sheet.

Borehole Data Form. This form will be completed for each boring (See Figure 3-4) using data from the Geologic Log Form and the field logbook. The upper row of information will be preprinted on the forms to be used in the field. In the lower section, the elements that are not preprinted will be completed in the field. The IRDMIS *User's Guide, Volume II, Data Dictionary* (USATHAMA, 1991a) contains information which will be used (as appropriate) to complete some of the elements. The information contained on this form will be used to construct IRDMIS Geotechnical Field drilling (GFD) files.

Boring Interval Data Form. This form will be completed for each interval of a boring (See Figure 3-5). using data from the Geologic Log Form and the field logbook. For example, if a boring is made with 10 sample intervals, only one Borehole Data Form is required, but ten Boring Interval Forms will be completed. The upper row of information will be preprinted on the forms to be used in the field. In the lower section, the elements that are not preprinted will be completed in the field. The IRDMIS *User's Guide, Volume II, Data Dictionary* (USATHAMA, 1991a) will be used (as appropriate) to complete some of the elements. The applicable information contained on this form will be used to construct IRDMIS GFD files.

Well Construction and Development Data Form. This form will be completed during well construction and development (See Figure 3-6) using data from the Geologic Log Form and the field logbook. The upper row of information will be preprinted on the forms to be used in the field. In the lower section, the elements that are not preprinted will be completed in the field. The IRDMIS *User's Guide, Volume II, Data Dictionary* (USATHAMA, 1991a) will be used (as appropriate) to complete some of the elements. The information contained on this form will be used to construct IRDMIS Geotechnical Well Construction (GWC) files.

Ground Water Stabilization Form. This form will be completed after well construction (See Figure 3-7). The form is used to compile ground water depths obtained during well development and purging stages prior to ground water sampling. The information contained on this form will be used to construct IRDMIS Geotechnical Ground Water Stabilization (GWS) files.

Map Coding Form. A map coding form will be completed for each sample point or area (See Figure 3-8). The map coordinate system and the method of determining the coordinates (read from map, digitized, or surveyed) will be recorded along with the x, y coordinates. Well and boring locations will be surveyed. The remaining sample locations will be read from a map. Information on the elevation of each sampling point will be recorded. As applicable, the information contained on this form will be used to construct IRDMIS Geotechnical Map (GMA) files.

Log Books. In addition to the data recorded on the data forms, a wide range of information pertaining to sampling events will be recorded in log books. These are the field log books, equipment log books, and health and safety log books.

3.6.2 Sample Analytical Data

Data from analyses performed by the laboratory are input into various chemical data files, including CGW (groundwater data), CSO (surface and subsurface soil data), and chain-of-custody QC data. A description of sampling and analytical data generation and manipulation is provided below.

Collection of analytical data will begin when samples arrive at the USATHAMA-approved laboratory. A laboratory technician will first verify that the samples noted on the chain of custody form coincide with the sample containers being delivered. If any containers are broken or missing, the chain of custody form will be annotated and the Field Team Leader will be notified immediately. Samples will be logged into a project-specific notebook and the laboratory data management system according to parameter code, site I.D., and laboratory sample number. The field parameter and chain of custody forms will then be submitted to a laboratory data technician for later correlation with the analytical results.

On receipt of the sample log information, the USATHAMA-approved laboratory management will assign analytical lot numbers to the samples in accordance with USATHAMA procedures. The first three letters of the six-character sample code will designate the analytical lot, while the remaining three digits will indicate the sample number within the lot (e.g., AABOO6 indicates the sixth sample

in lot AAB). All quality control samples required for each analytical lot (e.g., method blank, control spike at two times the CRL, and two control spikes at ten times the CRL) will also receive USATHAMA sample numbers. For additional descriptions of the protocols to arrange analytical lots see USATHAMA Quality Assurance Program, January, 1990.

3.6.3 Other Project Data

The Contractor will ensure that all documents collected, issued, or generated during the course of a task will be accountable upon completion of the project. All documents used or generated during the course of the project are accountable and become a part of the project files upon completion of the task. After technical work on this task has been completed, all accountable documents generated or used for the task work will be assembled and placed in a secure storage location. All accountable task documentation will then be inventoried by the DC files.

3.6.4 Tabular Displays

Several types of tabular displays are available through IRDMIS, including displays of the raw data sorted in various ways and displays of processed data for interpretation. Some of these are described briefly below.

3.6.4.1 Data by Medium and Location. The raw data, discussed above, will be developed into tables that show results of sample analyses. These tables are typically presented by medium and location.

3.6.4.2 Control Charts. Control charts are an important tool in demonstrating that analytical methods have been performed in accordance with data quality objectives. The "Installation Restoration Control Chart System" will be used to develop control charts from analytical data stored in IRDMIS files. An example is shown in Figure 3-9 of an X-bar control chart produced as a part of the USATHAMA QA program.

3.6.5 Data Validation For Chemical Analyses

Following are the procedures used in the IRDMIS software for evaluating the precision and accuracy of all environmental measurement data generated by this project. The protocol used for QC requirements is in accordance with specific analytical procedures, and the USATHAMA Quality Assurance Program, (USATHAMA, 1990).

3.6.5.1 Validation and Verification. When the analysis of a sample set is completed, the results are reviewed and evaluated to assess the validity of the data set. The review is outlined as follows:

- **Reagent Blank Evaluation** -- The reagent and/or method blank results are evaluated for readings characteristic of background contamination. If high blank values are observed, laboratory glassware and reagents are checked for contamination and the analysis is halted until the system is brought under control. A high blank value is

defined as a value sufficiently large enough as to affect the sample value, and if not corrected may result in an increase in the sample value greater than or equal to the smallest significant digit known to be true.

- **Equipment/Field/Trip Blank Evaluation** -- Field blank, trip blank, and equipment blank results are evaluated for high readings similar to the reagent and/or method blanks described above. If high readings are encountered, the procedure for sample collection, shipment, and laboratory analysis must be reviewed.

- **Standard Matrix Spike** -- The observed recovery of the spike versus the theoretical spike recovery is used to calculate accuracy as defined by the percent recovery. The accuracy value (the percent recovery) may be plotted on a control chart for the parameter determined to show method performance.

- **Calibration Standard Evaluation** -- The calibration curve is evaluated to determine linearity through its full range, and to verify that sample values are within the range defined by the low and high standards. If the curve does not meet method calibration criteria, corrective action is taken.

- **Duplicate Sample Evaluation** -- Duplicate sample analysis is used to determine the precision of the analytical method for the sample matrix. The duplicate results are used to calculate the precision as defined by the relative percent difference (RPD).

- **Reference Standard Evaluation** -- Standard Reference Material analyses are compared with true values and acceptable ranges. Values outside the acceptable ranges require corrective action to determine the source of error and provide corrective action. Should values outside acceptable ranges be reported, all sample analyses will be halted pending this evaluation. Following correction of the problem, the Standard Reference Material should be reanalyzed.

- **Check Standard Evaluation** -- The results of check standard analyses are compared with the true values and the percent recovery of the check standard is calculated. If correction is required, the check standard should be reanalyzed to demonstrate that the corrective action has been successful.

3.6.5.2 Evaluation of Data Using Control Charts. The subcontracted laboratory shall apply precision and accuracy criteria to each parameter that is analyzed through use of the IRDMIS software. When analysis of a sample set is completed, the quality control data are reviewed and evaluated through the use of control charts from the IRDMIS software to validate the data.

Control charts generated through the IRDMIS software will be established and maintained to track the performance of each analytical method for each analyte. Data to be used in control charts will be derived from certification data and daily quality control samples. Percent recoveries will be

calculated by subtracting the value of the method blank from the found concentration of the method spike, dividing the difference by the amount of spike, and multiplying the quotient by 100. These data will not be corrected for accuracy.

Each control chart contains the following information:

- Laboratory name
- Method number
- Chart title
  - Single day X control chart or
  - Single day R control chart or
  - Three point moving average X control chart or
  - Three point moving average R control chart
- Analyte
- Spike concentration
- Percent recovery (for X control charts) or Range (for R control charts)
- Lot designation and date on the x axis
- Mean, warning limits, and control limits

All control charts generated by the laboratory shall be forwarded to the USATHAMA Project Chemist within one week of analysis. A discussion of the IRDMIS control chart capabilities and procedures is in the following sections.

X Control Charts

Certification data will be used to initialize the X control charts using the following procedure:

a. Percent recoveries from certification days 1 and 2 will be averaged to obtain the first value.

b. Percent recoveries from certification days 3 and 4 will be averaged to obtain the second value.

c. Percent recoveries from the method spikes in the first lot will be averaged to obtain a third value.

d. The values from, a, b, and c will be averaged to obtain the average recovery (X) between pairs of spikes; this will be the central line of the X control chart.

e. The range (difference) of percent recoveries for each pair (days 1 and 2, days 3 and 4, and QC spikes from the first lot) will be averaged to obtain a value for R.

f. The upper and lower warning limits will be calculated from X +/- 1.25R, respectively.

g. The upper and lower control limits will be calculated from X +/- 1.88R, respectively.

R Control Charts

R control charts will be initiated using the same data as described for X control charts above.

a. R will be the base line of the control chart.
b. The upper warning limit will be 2.511R.
c. The upper control limit will be 3.267R.

Three Point Moving Average X Control Chart

Three-point moving average X (MAX) control charts will be constructed from the first three days of certification and updated from subsequent groups of three individual determinations of recoveries. The concentration to be plotted will be the concentration closest to twice the CRL.

a. The first point to be plotted will be the average percent recovery from the first three days of certification.

b. Subsequent points to be plotted will be the average percent recovery from subsequent groups of three determinations.

c. The range for each point is the difference between the highest and lowest values in each group of three determinations; the Moving Average R (MAR) will be the average of these ranges.

d. The central point (MAX) on the control chart will be the average of the plotted points.

e. The upper and lower warning limits will be MAX +/- 0.682 MAR, respectively.

f. The upper and lower control limits will be MAX +/- 1.023 MAR, respectively.

Three-Point Moving Average R Control Chart

Three-Point moving average R control charts will be constructed using the same data described for the MAX control charts, above.

a. The base line of the control chart will be the MAR, as described above.

b. The upper warning limit will be 2.050 MAR.

c. The upper control limit will be 2.575 MAR.

Out of Control Conditions

The following sections discuss the use of control charts to determine when analytical systems are out of control.

X Control Charts

Analysis will be considered to be out of control if:

a. A value is outside of the control limits.

b. A value is classified as an outlier by Dixon's test.

c. A series of 7 successive points occur on the same side of the central line.

d. A series of five successive points is going in the same direction.

e. A cyclical pattern of control values is evident.

f. Two successive points occur between the upper warning and control limits or between the lower warning and control limits.

g. More than one third of the analytes in a multi-analyte method are out of control.

R Control Charts

Analyses will be considered out of control if results show:

a. A value above the upper control limit.

b. A value determined to be an outlier by Dixon's test.

c. A series of five consecutive points going in an upward direction.

d. A cyclical pattern of control values.

e. Two successive points between the upper warning and upper control limits.

3.6.5.3 Evaluation of Analytical Precision. For replicate results D_1 and D_2, the RPD is calculated from:

$$RPD\ \% = \frac{D_1 - D_2}{(D_1 + D_2)/2} \times 100$$

When the RPD is obtained for at least ten replicate pairs, the average RPD and the standard deviation are calculated using:

$$\bar{m} = \frac{\sum_{i=1}^{n} m_i}{n}$$

and

$$Sm = \sqrt{\frac{\sum_{i=1}^{n} (\bar{m} - m)^2}{n - 1}}$$

where

m	=	the RPD of a replicate pair,
$\bar{m}$	=	the average of the Relative Percent Difference determinations,
Sm	=	the standard deviation of the data set of RPD determinations, and
n	=	the number of RPD determinations.

When constructing a control chart for a specific parameter, the Warning and Control Limits are then calculated from the following:

Upper Control Limit	=	$\bar{m} + 3\ Sm$
Lower Control Limit	=	$\bar{m} - 3\ Sm$
Upper Warning Limit	=	$\bar{m} + 2\ Sm$
Lower Warning Limit	=	$\bar{m} - 2\ Sm$

A control chart is established by plotting the RPD of each replicate pair on a graph generated as follows:

- The calculated RPD of each replicate pair is plotted on the graph to determine whether the RPD is within the Warning and Control Limits of the Control Charts. These control charts are used to show method performance and to document that the default control limits used by the laboratory for method control are met on a routine basis.

- If the RPD plots are outside the Control Limits for control spikes (blanks spikes of LCS's), the source of error is determined and corrective action is implemented.

3.6.5.4 Evaluation of Analytical Accuracy. To determine the accuracy of an analytical method and/or the laboratory analyst, a periodic program of sample spiking is conducted. The results of sample spiking will be used to calculate the quality control parameter for accuracy evaluation, the percent recovery (% R).

The % R is defined as 100 times the observed concentration, minus the sample concentration, divided by the true concentration of the spike.

$$\%R = \frac{O_i - O_s}{T_i} \times 100\%$$

where

$\%R$	=	the percent recovery
O_i	=	the observed spiked sample concentration,
O_s	=	the sample concentration, and
T_i	=	the true concentration of the spike

The true Concentration is calculated from:

$$T_i = \frac{\text{Spike Concentration [c] (mg/L) x Volume of Spike (in mL)}}{\text{Volume of Sample [in mL] + Volume of Spike [in mL]}}$$

When the Percent Recovery is obtained for at least ten spiked samples, the mean percent recovery and the standard deviation can be calculated using the formulae:

$$\overline{\%R} = \frac{\sum_{i=1}^{n} \%R_i}{n}$$

and

$$S_R = \frac{\sum_{i=1}^{n} (\%R_i - \%R)^2}{n - 1}^{1/2}$$

where

$\overline{\%\ R}$ = the mean percent recovery

$\%\ R_i$ = the percent recovery of a single spiked sample,

n = the number of results, and

S_R = the standard deviation of the data set of percent recovery determinations.

The Warning Control Limits are then calculated from the following equations:

Upper Control Limit	=	$\%\ R + 3\ S_R$
Lower Control Limit	=	$\%\ R - 3\ S_R$
Upper Warning Limit	=	$\%\ R + 2\ S_R$
Lower Warning Limit	=	$\%\ R - 2\ S_R$

A control chart is generated by plotting the percent recovery data on a graph as follows:

- The average of the percent recovery determinations for the original data set is established as the midpoint on the Y axis above the mean of the percent recovery on the graph.
- The Upper Warning and Control Limits calculated above are plotted as solid horizontal lines across the graph at their respective points on the Y axis above the mean of the percent recovery determinations.
- The Lower Warning and Control Limits calculated above are plotted as solid horizontal lines.
- If the percent recovery is plotted outside the Control Limits for reference controls (blank spikes and duplicates, LCS and duplicates), the source of error is determined and corrective action is implemented. Once the error source has been resolved, the data set shall be reanalyzed on a case by case basis.
- On a periodic basis, the Warning and Control Limits are recalculated for the entire data set and the Control Chart for the corresponding parameter is updated.

All control charts are maintained by the Laboratory Quality Assurance Coordinator, as well as distributed to appropriate laboratory management.

3.6.5.5 Evaluation of Completeness. Completeness is calculated as the percentage of valid data points obtained compared to the amount of valid data that was planned to be collected to achieve particular project requirements. Data points may not be valid if samples exceed holding times, if quality control sample criteria are not met and reanalysis of samples was not possible, or if sample containers are broken or otherwise destroyed. The overall completeness objective for this project is 100%.

3.6.5.6 Contractor Validation Activities. When the Contractor receives the analytical data package from the USATHAMA-approved laboratory, the Contractor project staff will review the data. The data will be in the form of IRDMIS computer data files and an accompanying report that identifies all nonconformance and out-of-control situations, and subsequent corrective actions. These data will be reviewed to confirm that all field data taken by Contractor staff correspond to that in the IRDMIS data base. If data are found to conflict, those conflicts will be identified and immediately communicated to the Laboratory Manager for resolution. A Non-Conformance Report (NCR) (Figure 3-10) will be completed for each conflict and a Corrective Action Report (CAR) (Figure 3-11) will be prepared and implemented to insure that the data quality objectives of this project are met.

Section 3.7, Page 34, Paragraph 1, Line 4-5.

Change: "...recommended risk assessment guidance, and will therefore serve as the reference document for conducting risk assessment activities at the Lexington Facility."

Change to: "...recommended risk assessment guidance, and will therefore serve as the primary reference document for conductivity risk assessment activities at the Lexington Facility. Additionally, Section 8.0 of the RFI guidance report (USEPA, 1989) will be used in the risk assessment.

Sections 3.7.1 - 3.7.3.3. These sections of the original plan are unchanged and apply as written.

Section 3.7.3.4, Page 38, Paragraph 1, Lines 5-7.

Change: "A dose-response evaluation will provide critical toxicity values (i.e., dose levels for contaminants in the media of concern for each species of concern)."

Change to: If warranted, a dose-response evaluation will provide critical toxicity values (i.e., dose levels for contaminants in the media of concern for each species of concern).

Section 3.7.3.5. This section of the original plan is unchanged and applies as written.

Section 3.8, Page 39, Paragraph 2, Line 1-2.

Change: The report format will be as shown on Table 3-2.

Change to: The report format will generally follow the format shown on Table 3-2.

Section 3.9 - 3.10. These sections of the original plan are unchanged and apply as written.

Section 4.0 - 4.1.1.3. These sections of the original plan are unchanged and apply as written.

Section 4.1.1.4, Page 48, Paragraph 3, Line 4.

Change: "...source characterization. If the full..."

Change to: "...source characterization. One soil sample will be taken from the bottom of each trench at the waste/native soil interface. If the full..."

Section 4.1.1.4, Page 49, Paragraph 3, Lines 6-7.

Change: "...are such that three a believed to be directly downgradient. This determination is based on the preliminary belief that groundwater flow direction follows surface topography."

Change to: "...are such that two may be downgradient to the west/northwest and one downgradient to the south. This determination is based on the possibility that groundwater flow follows surface topograph which slopes to the west and south.

Section 4.1.2 - 4.1.4.3. These sections of the original plan are unchanged and apply as written.

Section 4.1.4.4, Page 59, Paragraph 4, Line 5.

Change: "TCLP"

Change to: "TCL"

Section 4.1.4.4, Page 60, Paragraph 2, Line 3.

Change: "TCLP"

Change to: "TCL"

Section 4.1.4.4, Page 61, Paragraph 1, Lines 4-6.

Change: "...depth of disposal. Four deep soil...as determined by trenching."

Change to: "...depth of disposal. One soil sample will be taken from the bottom of the trench at the waste/native soil interface. Four deep...collected from 0 to 1 foot and 2 to 3 feet.

Sections 4.1.5.1 - 4.1.5.3. These sections of the original plan are unchanged an apply as written.

Section 4.1.5.4, Page 63, Paragraph 3, Lines 4-10.

Change: "...the type of contamination. Sediment...depth from six sample locations...analyzed for TCL compounds, soil pH and TCLP contaminants. The TCLP anatytical...important to the CMS process. TCLP analysis and soil pH...whether the sludge is hazardous waste (for disposal considerations), while TCL results will be used to establish the range and concentrations of contaminant compounds."

Change to: "...the type of contamination. Sediment...depth from three sample locations...analyzed for TCL compounds and soil pH. The TCL analytical...important to the CMS process. TCL analysis and soil pH...whether the sludge contains hazardous constituents, poses a risk, and to establish the range and concentrations of contaminant compounds."

Section 4.1.5.4, Page 64, Paragraph 1, Line 4.

Change: "12 locations"

Change to: "8 locations"

Section 4.1.5.4, Page 64, Paragraph 3, Line 1.

Change: "Three sediment"

Change to: "Two sediment"

Sections 4.1.6 - 4.2.1.3. These sections of the original plan are unchanged and apply as written.

Section 4.2.1.4, Page 68, Paragraph 2.

Change: Delete paragraph.

Section 4.2.1.4, Page 68, Paragraph 3, Lines 1-2.

Change: "Concrete chip...collected in some of the areas described above and analyzed to TCLP compounds."

Change to: "Concrete chip...collected in the two painting areas, plating area, and the main production area and analyzed for TCL compounds.

Section 4.2.1.4, Page 68, Paragraph 5, Line 3.

Change: "TCLP"

Change to: "TCL"

Sections 4.2.2.1 - 4.2.2.3. These sections of the original plan are unchanged and apply as written.

Section 4.2.2.4, Page 69, Paragraph 5, Line 1.

Change: "Three wipe samples will be collected"

Change to: "Up to four concrete chip samples will be collected"

Section 4.2.2.4, Page 70, Paragraph 1.

Change: Delete existing paragraph and insert the following.

Change to: Based on a decision made in the field, wipe samples will be substituted for chip samples if conditions are such that concrete samples cannot be collected.

Sections 4.2.3 - 4.3.1.3. These sections of the original plan are unchanged and apply as written.

Section 4.3.1.4, Page 72, Paragraphs 3-4.

Change: "Five (5) wipe samples..."

Change to: "Five (5) chip samples...to the building interior. If possible the chip samples will be taken if there is strong evidence...

Section 4.3.2.1 - 4.3.2.3. These sections of the original plan are unchanged and apply as written.

Section 4.3.2.4, Page 73, Paragraph 4, Line 2.

Change: "TCLP"

Change to: "TCL"

Sections 4.3.3.1 - 4.3.3.3. These sections of the original plan are unchanged and apply as written.

Section 4.3.3.4, Page 74, Paragraph 3, Line 4.

Change: "TCLP"

Change to: "TCL"

Sections 4.3.4 - 4.3.5.3. These sections of the original plan are unchanged and apply as written.

Section 4.3.5.4, Page 75, Paragraph 6, Line 4.

Change: "TCLP"

Change to: "TCL"

Sections 4.3.6.1 - 4.3.6.3. These sections of the original plan are unchanged and apply as written.

Section 4.3.6.4, Page 76, Paragraph 5, Lines 3-5.

Change: "Four (4) wipe and two concrete chip samples..."

Change to: "One (1) wipe and one (1) concrete chip sample...interior. Also, one (1) concrete chip sample will be collected outside the building in an area evident of staining.

Sections 4.3.7.1 - 4.3.7.3. These sections of the original plan are unchanged and apply as written.

Section 4.3.7.4, Page 77, Paragraph 4, Line 3.

Change: "TCLP"

Change to: "TCL"

Sections 4.3.8.1 - 4.3.8.3. These sections of the original plan are unchanged and apply as written.

Section 4.3.8.4, Page 78, Paragraph 3, Lines 2-7.

Change: "Three (3) wipe samples will be collected from the interior of the building for TCL metals, semi-volatiles and PCB analyses to screen for possible contaminant releases in that area. Two soil samples will be collected from the soil adjacent to the oily stained asphalt to the northeast of the building for TCL analysis (except volatiles). Soil samples will be located in an area which intercepts rainfall runoff from the stained area."

Change to: "One (1) wipe sample will be collected from the filtration equipment present and analyzed for TCL compounds. Also, two (2) concrete chip samples will be collected from the interior of the building in areas which are stained, and analyzed for TCL compounds. One soil sample will be collected from the soil adjacent to the oily...(except volatiles). The soil sample will...stained area."

Sections 4.3.9 - 4.4.1.3. These sections of the original plan are unchanged and apply as written.

Section 4.4.1.4, Page 81, Paragraph 3.

Change: Delete paragraph and insert the following.

Change to: Up to three (3) concrete chip samples, or where chip samples cannot be taken, wipe samples will be collected in areas where evidence of spillage is apparent or where past spillage is likely. Samples will be analyzed for TCL semi-volatiles.

Sections 4.4.2 - 4.4.3.3. These sections of the original plan are unchanged and apply as written.

Section 4.4.3.4, Page 83, Paragraph 2, Lines 2-3.

Change: "TCLP" in 3 places.

Change to: "TCL" in 3 places.

Sections 4.5.1 - 4.5.3. These sections of the original plan are unchanged and apply as written.

Section 4.5.4, Page 85, Paragraph 4, Line 2.

Change: "TCLP"

Change to: "TCL"

Sections 4.6.1.1 - 4.6.1.3. These sections of the original plan are unchanged and apply as written.

Section 4.6.1.4, Page 87, Paragraph 1, Line 4.

Change: "TCLP"

Change to: "TCL"

Section 4.6.2, Page 87.

Change: "Building 27"

Change to: "Building 27 (SWMU #9)"

Sections 4.6.2.2 - 4.6.2.3. These sections of the original plan are unchanged and apply as written.

Section 4.6.2.4, Page 88, Paragraph 1, Line 5.

Change: "...concrete chip samples for TCLP analysis and wipe samples in each room"

Change to: "...concrete chip samples for TCL analysis in each room"

Sections 4.6.3 - 4.9.3. These sections of the original plan are unchanged and apply as written.

Section 4.9.4, Page 93, Paragraph 3, Line 6.

Change: "TCLP"

Change to: "TCL"

Sections 4.10.1 - 4.10.3. These sections of the original plan are unchanged and apply as written.

Section 4.10.4, Page 95, Paragraph 1, Lines 2-3.

Change: "TCLP" in two places.

Change to: "TCL" in both places.

Section 5.0, Page 112, Paragraph 3. Delete the "team leaders" paragraph.

Section 5.2 Page 114, Paragraph 3

Change: Delete paragraph and insert the following.

Change to: The Task Order schedule indicates the RFI/CMS will be completed in March 1993. Every effort will be made to complete the task in February, 1993, to meet the proposed base closure schedule.

Tables

Table 3-4 is a new table for data management. See attached table.

Table 4-1 revised to show new sample number. See attached revised table.

Figures

Figure 4-1 revised to show new well and sampling locations. See attached revised map.

Figure 4-2 revised to show new well and sampling locations. See attached revised map.

Figure 4-4 revised to show new well and sampling locations. See attached revised map.

TABLE 3-4

TIME FRAMES FOR IRDMIS DATA SUBMISSION

File Type	Submission Due
Geotechnical Map File	40 calendar days after completion of last well or soil boring in drilling program.
Geotechnical Ground Water Stabilized File	7 calendar days after measurement.
Geotechnical Field Drilling File	30 days after completion of last well in drilling program or last soil boring.
Geotechnical Well Construction File	30 days after completion of last well in drilling program.
Geotechnical	14 days after test.
Geotechnical Physical Analysis File	14 days after analysis.
Chemical - Ground Water - Soil	40 calendar days after collection of sample (level 2 data except those requiring USATHAMA approval).

TABLE 4-1
REQUIRED SAMPLES

AREE

Survey Type or Media	Figure Showing Locations	Number of Locations	Samples at Each Location	QA/QC Samples duplicates	QA/QC Samples blanks	Total Samples	Analytical Parameters
Old Landfill							
Soil Borings		10	1-2', 2-3'	0	2	22	TCL
			0-1'	0	1	11	TCL (exc VOCs)
Groundwater	4.1	5 new wells	1	1	1	7	TCL
Seeps		up to 4	1	0	0	up to 4	TCL
Tributary Water	4.1	4	1	1	1	6	TCL
Tributary Sediment	4.1	4	0-1', 1-2'	0	1	9	TCL
Geophysical Survey							
Slug Testing		5					
Trenches		4	1				
Industrial and Sanitary Waste Disposal Landfill							
Drainage Ditch							
Soil/Sediment	4.1	3 ditches	2 per ditch	0	1	7	TCL (exc VOCs)
Tributary Water	4.1	4	1	1	1	6	TCL
Tributary Sediment	4.1	4	0-1', 1-2'	0	1	9	TCL
Groundwater	4.1	3 new wells, 3 existing wells	1	1	1	8	TCL
Seeps		up to 4		0	0	up to 4	TCL
Geophysical Survey							
Slug Testing		3					
New Landfill							
Drainage Path							
Soil/Sediment	4.2	6 paths	1 per path	0	1	7	TCL (exc VOCs)
Groundwater	4.2	6 new wells, 4 existing wells	1	1	1	12	TCL

TABLE 4-1
REQUIRED SAMPLES

AREE

Survey Type or Media	Figure Showing Locations	Number of Locations	Samples at Each Location	QA/QC Samples duplicates	QA/QC Samples blanks	Total Samples	Analytical Parameters
Seeps		up to 4		0	0	up to 4	TCL
Geophysical Survey							
Slug Testing		6					
Area A	4.3						
Tank Contents		1	1	1	0	3	TCLP, pH, reactivity ignitability
Soil Borings		3	1-2', 3-4'	0	1	7	TCL
Sump Sediments		1	1	0	0	1	TCLP
Drainage Path Soil/Sediment		1 path	3 per path	0	0	3	TCL (exc VOCs)
Geophysical Survey							
Area B	4.3						
Soil Borings		<6	2-3'	0	1	7	TCL
			0-1,	0	0	6	TCL (exc VOCs)
Trench Soil		2	1	0	0	2	TCL
Geophysical Survey							
Area C	4.3						
Soil Borings		2	0-1,	0	0	2	TCL (exc VOCs)
			2-3', interface	0	1	3	TCL
Trench Soil		1	1			1	
Drainage Path		2	0-11	0	0	2	TCL (exc VOCs)
Soil/Sediment			1-2'	0	0	2	TCL
Geophysical Survey							
Industrial Waste Laaoons							
Sediment	4.4	3 per lagoon	0-1'. 2-3',	0	1	13	TCL,TCLP,PH
South Berm Soil Borings	4.4	4	0-1,,	0	1	5	TCL (exc VOCs)
			2-3', 4-5'	0	0	8	TCL

TABLE 4-1
REQUIRED SAMPLES

AREE

Survey Type or Media	Figure Showing Locations	Number of Locations	Samples at Each Location	QA/QC Samples duplicates	QA/QC Samples blanks	Total Samples	Analytical Parameters
North Side Soil Borings	4.4	8	0-11	0	0	8	TCL (exc VOCs)
			2-3-	0	1	9	TCL
Lagoon Water	4.4	2	1	1	1	4	TCL
Groundwater	4.4	1 new well, 3 existing wells	1	1	0	5	TCL
Seeps	4.4	up to 3	1	0	0	up to 3	TCL
Drainage Path	4.4	6	0-1,	1	1	8	TCL (exc VOCs)
Soil/Sediment		6	1-2'	0	0	6	TCL
Slug Testing		1					
Surface Wood Pile/Fire Training Area							
Surface Soil		6	1	0	1	7	TCL (exc VOCs)
Soil Gas		3	1	0	0	3	
Building 135							
Concrete Chip		5	1	0	0	5	TCL
Gravel Pit Soil		1	1	0	0	1	TCL (exc VOCs)
Sump Sediments		1	1	0	0	1	TCLP
Soil Gas		8	1	0	0	8	TCL
Building 147							
Concrete Chip		4	1	0	0	4	TCL
Soil Gas		8	1	0	0	8	TCL
Building 221							
Wipe		2	3	0	1	7	PCBs
Drainage Path Soil/Sediment		2 paths	1 per path	0	1	3	PCBs

TABLE 4-1
REQUIRED SAMPLES

AREE

Survey Type or Media	Figure Showing Locations	Number of Locations	Samples at Each Location	QA/QC Samples duplicates	QA/QC Samples blanks	Total Samples	Analytical Parameters
Building 3							
Concrete Chip		5	1	0	0	5	TCL
Soil Gas		16	1	0	0	16	TCL
Building 10							
Drainage Path	4.6						
Soil/Sediment		3	0-1'	0	0	3	TCL (exc VOCs),TPH
Concrete Chip		1	1	0	0	1	TCL
Soil Gas		4	1	0	0	4	TCL
Building 19							
Concrete Chip		1	1	0	0	1	TCL
Soil Gas		4	1	0	0	4	TCL
Building 43							
Soil Gas		4	1	0	0	4	TCL
Building 63	4.7						
Concrete Chip		1	1	0	0	1	TCL
Surface Soil		2	0-1'	1	1	4	TCL metals, semivolatiles
Soil Gas		4	1	0	0	4	TCL
Building 64							
Surface Soil		4	0-1'	0	0	4	PCBs
Wipe		1	1	0	1	2	PCBs
Concrete Chip		up to 2	1			up to 2	PCBs
Building 107							
Concrete Chip		1	1	0	0	1	TCL
Soil Gas		4	1	0	0	4	TCL

TABLE 4-1
REQUIRED SAMPLES

AREE

Survey Type or Media	Figure Showing Locations	Number of Locations	Samples at Each Location	QA/QC Samples duplicates	QA/QC Samples blanks	Total Samples	Analytical Parameters
Building 130							
Surface Soil	4.8	1	0-1'	0	0	1	TCL (exc VOCs)
Wipe		1	1	0	0	1	metals,semivolatiles,PCBs
Soil Gas		4	1	0	0	4	TCL
Concrete Chips		2	1	0	0	2	TCL
Building 134							
Sink Trap Inspection							
Building 140, 141							
Soil Gas		8	1	0	0	8	TCL
Alpha/Gamma Radiation Scan							
Building 4, 5, 135, 139							
Radioactivity Survey							
Concrete Chip		12	1	0	0	12	TCL
Wipe		12	1	0	0	12	TCL
Building 6							
Wipe		3	1	0	1	4	TCL, semi-volatiles
Building 139 Sump							
Sump Sludge		1	1	0	0	1	TCL
Soil Borings		4	0-11	0	0	4	TCL (exc VOCs)
			2-3', 5-6'	0	1	9	TCL
Drainage Path		2	1	0	0	2	TCL
Soil/Sediment							
Wastewater Treatment							
Soil Borings		6	2, 0-1'	0	0	12	TCL (exc VOCs)
			2, 2-3'	0	1	13	TCL

TABLE 4-1
REQUIRED SAMPLES

AREE

Survey Type or Media	Figure Showing Locations	Number of Locations	Samples at Each Location	QA/QC Samples duplicates	QA/QC Samples blanks	Total Samples	Analytical Parameters
Sludge		3	1	1	0	4	TCL
Sediment		5	1	0	1	6	
Building 16							
Concrete Chip		1	1	0	0	1	TCL
Soil Gas		4	1	0	0	4	TCL
Building 27							
Surface Soil		2	1	0	0	2	TCL (exc VOCs)
Concrete Chip		6	2	0	0	12	TCL
Soil Gas		4	1	0	0	4	TCL
Building 42							
Soil Gas		4	1	0	0	4	TCL
Buildings 9, 46							
Surface Soil		3	1	0	1	4	TCL (exc VOCs), TPH
Sludge		1	1	0	0	1	TPH, PCBs, semi-volatiles
Soil Gas		3	1	0	0	3	TCL
Landing Field							
Geophysical							
Soil Gas		8	1	0	0	8	TCL
Building 40							
Soil		3	1	0	0	3	PCBs, TPH
Wipe		2	1	0	0	2	PCBs
Heating Plant Area							
Soil Borings		4	0-1'	0	0	4	TCL (exc VOCs), pH
			2-3'		1	5	TCL,pH
Concrete Chip		1	1	0	0	1	TCL

TABLE 4-1
REQUIRED SAMPLES

AREE

Survey Type or Media	Figure Showing Locations	Number of Locations	Samples at Each Location	QA/QC Samples duplicates	QA/QC Samples blanks	Total Samples	Analytical Parameters
Industrial Wastewater Treatment Plant/Sand Drying Beds							
Soil Borings		2 per bed	0-1'	0	0	4	TCL (exc VOCs)
			2-3', 4-5'	0	1	9	TCL
Sludge		3	1	1	1	5	TCL
Deep Soil Borings		4	1	1	1	6	TCL
Building 8							
Soil		2	0-1'	0	0	2	TPH, PCBs, Pesticides
Concrete Chips		3 bldgs	2 per bldg	0	1	7	TCL Pesticides,PCBs
Building 45							
Soil		2	0-1'	0	0	2	TCL Pesticides
Wipe		2	1	0	0	2	TCL Pesticides
Building 303							
Surface Soil		2	0-1'	0	1	3	TCL Pesticides
Wipe		2	1	0	1	3	TCL Pesticides
Underground Tanks							
Soil Gas							
Buildings 103, 128, 139, 14							
Beta/Gamma Radiation Walk-Through							
Open Storage and Shelter Areas							
Surface Soil		11	0-1'	0	1	12	TCL (exc VOCs)
Wipe		2	1	0	0	2	PCBs
Soil Gas							

TABLE 4-1
REQUIRED SAMPLES

AREE

Survey Type or Media	Figure Showing Locations	Number of Locations	Samples at Each Location	QA/QC Samples duplicates	QA/QC Samples blanks	Total Samples	Analytical Parameters
DRMO Spill Area							
Surface Soil		6	0-1'	0	1	7	TCL (exc VOCs)
Transformer Spill Area							
Surface Soil		2	0-1'	0	0	2	PCBs
Water Supply Wells 1, 3, 4, 7, 8, 9							
Groundwater		6	1	1	1	8	TCL, TPH
Water Levels							
Asbestos							
Building Assessments		up to 200					
Lead-Based Solder and Piping							
Water		app.20	1	2	2	app. 24	Lead
Stream Investigation							
Surface Water		up to 32	1	3	3	up to 37	TCL
Sediment		up to 32	1	3	3	up to 37	TCL
Culverts							
Sediment		5	1	1	1	7	TCL
Background Samples							
Soil Borings		7	0-1'	0	0	7	TCL (exc. VOCs)
			2-3'	0	0	7	TCL

Metcalf & Eddy, Inc. ENGINEERS

GEOLOGIC LOG

PROJECT :

SITE LOCATION:

JOB NO.

SHEET 1 OF

BORING NO.

LOCATION:

GROUND ELEV.

TOTAL DEPTH

DRILL CONTRACTOR:

ENG/GEO:

BEGUN :

DRILL RIG:

DRILLER:

FINISHED:

HOLE SIZE:

WEATHER:

GROUND WATER (DEPTH/ELEV.):

/

DRILLING METHOD:

DRILLING FLUID/SOURCE:

TOP OF ROCK (DEPTH/ELEV.):

DEPTH	SAMPLE TYPE/NO.	SAMPLE DEPTH	SAMPLE RECOVERY	BLOW COUNT (per 6 inches) OR DRILLING TIME (min/ft)	% RECOVERY OR RQD	SAMPLE DESCRIPTION	ELEVATION	GRAPHIC LOG	STRATIGRAPHIC DESCRIPTION
5									
10									
15									
20									
25									

SAMPLE TYPES
SS=SPLIT SPOON, ST=SHELBY TUBE
R=ROCK CORE, O=OTHER

NOTES:

BORING NO.:

Figure 3-1

Geologic Log

Metcalf & Eddy, Inc.
ENGINEERS

GEOLOGIC LOG

PROJECT :		SHEET OF	BORING NO.
SITE LOCATION:	JOB NO.		
	LOCATION:	GROUND ELEV.	TOTAL DEPTH

DEPTH	SAMPLE TYPE/NO.	SAMPLE DEPTH	SAMPLE RECOVERY	BLOW COUNT (per 6 inches) OR DRILLING TIME (min/ft)	% RECOVERY OR RQD	SAMPLE DESCRIPTION	GRAPHIC LOG

SAMPLE TYPES
SS=SPLIT SPOON, ST=SHELBY TUBE
R=ROCK CORE, O=OTHER

NOTES:

BORING NO.:

Figure 3-1

Geologic Log (Continued)

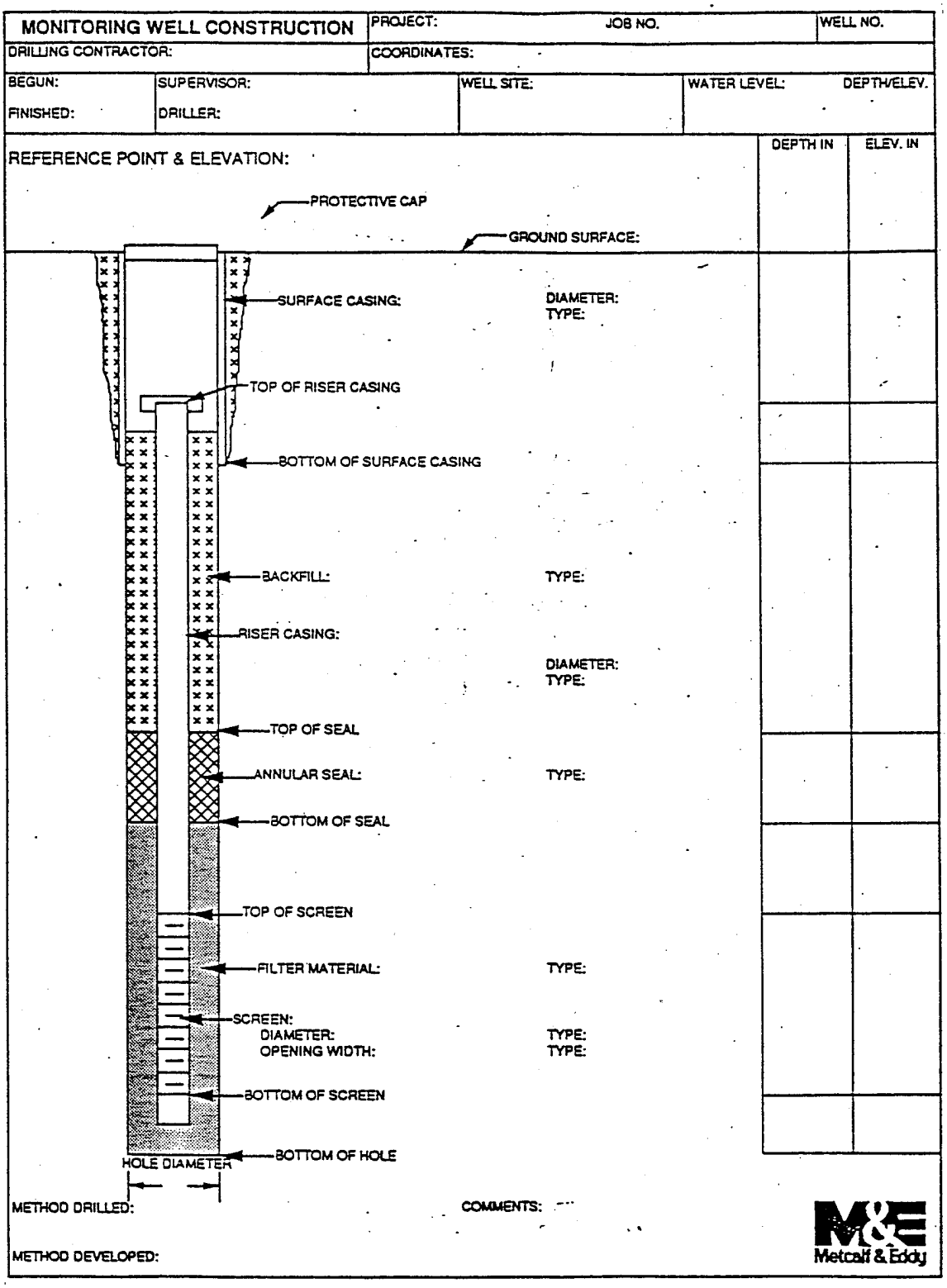


Figure 3-2

Monitoring Well Construction

J#007248-0002/gt
USATHAMA TO#4/mgtrespl

Figure 3-3

Chain-of-Custody Record

PROJECT NAME: Lexington Bluegrass Depot

CHAIN -OF-CUSTODY RECORD

PROJECT NO. 007248

INSTALLATION CODE: LX

LABORATORY: Data Chem

PRIME CONTRACTOR: MF

BASE CLOSURE INDICATOR: Y

SAMPLE PROGRAM: RFI

SAMPLER NAME/SIGNATURE:

DATE	TIME MILITARY	FIELD SAMPLE #	SITE ID#	FILE TYPE	SITE TYPE	DEPTH (FT.)	SAMPLE TECH.	NO. OF CONTS.	PRESERV (TYPE)

PARAMETERS

VOCS	SNAS	METALS ICP Hg-CVAA	METALS GFAA	HERBICIDES	PEST./PCB	ANIONS	CYANIDE		

Method No.

Relinquished by: (Signature) | Date/Time: | Received by: | Date/Time:

Remarks:

Send Results to:

Dr. Joe Towarnicky
Metcalf & Eddy, Inc
2800 Corporate Exchange Dr.
Suite 250
Columbus, Ohio 43231
614-890-5501

Sample sent to:

Lab: Data Chem

Address: 960 West LaVoy Dr.
Salt Lake City, Utah 84123-2547

Phone: 801-266-7700

Air Bill Company / No.:

Metcalf & Eddy

BOREHOLE DATA FORM

SITE ID:

INITIALS:

Site Type	File Type	Installation Code	Organization	Prime Contractor	Lab
Bore	GFD	FC			

ACTION	DATE MM/DD/YR	METHOD (a)	DEPTH (b)	INTERVAL(c)	VALUE (d)	UNIT	ENTRY (e)
BAILT/Time, to the nearest 0.1 min, to bail or pump volume of water specified in "BAILV" from borehole		0	0	0		MIN	0
BAILV/Volume of water bailed or pumped to the nearest 0.1 L		0	0	0		L	0
BSTAT/Borehole status		01	0	0	0	0	
CAVEI/Length of cave-in inside borehole to the nearest 0.1 ft		01			0	FT	0
DBRK/Depth from ground surface to bedrock to the nearest 0.1 ft		01	0	0		FT	0
* DPTOT/Depth from ground suface to the deepest point encountered during drilling and/or sampling in borehole to the nearest 0.1 ft						FT	
* GRDWT/Depth from ground surface to first encountered ground water level at time of drilling to the nearest 0.1 ft			0	0		FT	0
RECVR/Recovery or rise of water to the nearest 0.1 ft in the borehole after pumping or bailing the borehole dry		0	0	0		FT	0
RECVT/Time, in min, of recovery or rise of water in borehole after pumping or bailing the borehole dry						MIN	
RFSUL/Depth from ground surface to refusal to the nearest 0.1 ft		01	0	0	0	FT	0
SURF/Surface cover at drilling site		01	0	0	0	0	
TOPO/Topographic setting at drilling site		01	0	0		0	

COMMENTS (f): _____

(a)-Method used to complete action. Option codes located in Section 10.08 of User's Guide, Volume II, Data Dictionary (USATHAMA, 1991a).

(b)-Depth (to nearest 0.1 ft) from the topographic surface to the top of the interval for which the action or measurement was taken. Option codes located in Section 10.03 of User's Guide, Volume II, Data Dictionary (USATHAMA, 1991a).

(c)-Thickness (to the nearest 0.1 ft) of the interval for which the action or measurement was taken. Option codes located in Section 10.06 of User's Guide, Volume II, Data Dictionary (USATHAMA, 1991a).

(d)-The value associated with the method, unit of measure, and interval (when appropriate). Option codes located in Section 10.10 of User's Guide, Volume II, Data Dictionary (USATHAMA, 1991a).

(e)-Code describing the result of the action or condition of the measurement. Option codes located in Section 10.04 of User's Guide, Volume II, Data Dictionary (USATHAMA, 1991a).

(f)-Not entered into IRDMIS system.

* Requires data entry, other fields not required to be completed.

Figure 3-4

Borehole Data Form

BORING INTERVAL DATA FORM

SITE ID:

INITIALS:

Site Type	File Type	Installation Code	Organization	Prime Contractor	Lab
Bore	GFD	FC			

ACTION	DATE MM/DD/YR	METHOD (a)	DEPTH (b)	INTERVAL (c)	VALUE (d)	UNIT	ENTRY (e)
ADVAU/Advancement of boring through an interval to the nearest 0.1 ft						FT	
BFILL/Length of borehole fill to the nearest 0.1 ft					0	FT	0
COLOR/Inspection of the color of cuttings or samples (Munsell or GSA)					0	0	
CONSS/Inspection of the consistency of the cuttings or samples		01			0	0	
DRIVE/Length of samples pushed or driven to the subsurface to the nearest 0.1 ft		01			0	FT	0
GRAIN/Grain size of samples		01			0	0	
HABLO/Count of hammer blows per foot of drive		01				BL	0
HYPRS/Hydraulic pressure in pounds per square inch		01				PSI	0
MODIF/Modification of cuttings or based on field observation		01			0	0	
MOISC/Moisture content in samples		01			0	0	
SAMPL/Internal thickness, to the nearest 0.1 ft, of a sample retained for test and analysis					0	0	0
TIME/Time, in SEC, of drive using a stopwatch						SEC	0
USCS/Classification of an interval using the Unified Classification System		01			0	0	

COMMENTS (f): _____

(a)–Method used to complete action. Option codes located in Section 10.08 of User's Guide, Volume II, Data Dictionary (USATHAMA, 1991a).

(b)–Depth (to nearest 0.1 ft) from the topographic surface to the top of the interval for which the action or measurement was taken.
Option codes located in Section 10.03 of User's Guide, Volume II, Data Dictionary (USATHAMA, 1991a).

(c)–Thickness (to the nearest 0.1 ft) of the interval for which the action or measurement was taken.
Option codes located in Section 10.06 of User's Guide, Volume II, Data Dictionary (USATHAMA, 1991a).

(d)–The value associated with the method, unit of measure, and interval (when appropriate).
Option codes located in Section 10.10 of User's Guide, Volume II, Data Dictionary (USATHAMA, 1991a).

(e)–Code describing the result of the action or condition of the measurement.
Option codes located in Section 10.04 of User's Guide, Volume II, Data Dictionary (USATHAMA, 1991a).

(f)–Not entered into IROMIS system.

* Requires data entry, other fields not required to be completed.

Figure 3-5

Boring Interval Data Form

WELL CONSTRUCTION AND DEVELOPMENT DATA FORM

SITE ID:

INITIALS:

Site Type	File Type	Installation Code	Organization	Prime Contractor	Lab
Well	GWC	FC			

ACTION	DATE MM/DD/YR	METHOD (a)	DEPTH (b)	INTERVAL (c)	VALUE (d)	UNIT	ENTRY (e)
BAILT/Time, to the nearest 0.1 min, to bail or pump volume of water specific in "BAILV" from well		0	0	0		MIN	0
BAILV/Volume of water to the nearest 0.1 L bailed or pumped from well		0	0	0		L	0
BFILL/Length of borehole fill to the nearest 0.1 ft					0	FT	0
* BSEAL/Length, to the nearest 0.1 ft, of bentonite seal of an overburden well		01			0	FT	0
* CASE/Length, to the nearest 0.1 ft, from ground surface to top of screen of an overburden well		01	0	0		FT	0
* CASED/Inside diameter, to the nearest 0.1 ft, of casing of an overburden well		01	0	0		FT	0
CASES/Inside diameter of permanent external casing of overburden well		01	0	0		FT	0
CSEAL/Length, to the nearest 0.1 ft, of permanent external casing used to seal off the overburden well		01	0	0		FT	0
* DPTOT/Depth, to the nearest 0.1 ft, from ground surface to the deepest point encountered during drilling		01	0	0		FT	0
* GFILT/Length, to the nearest 0.1 ft, of gravel filter or sand pack		01			0	FT	0
* GROUT/Length, to the nearest 0.1 ft, of the interval filled with neat cement or cement grout					0	FT	0
LYSPD/Depth, to the nearest 0.1 ft, from ground surface to top of lysimeter		01	0	0		FT	0
RECVR/Recovery or rise, to the nearest 0.1 ft, of water in well after pumping or bailing well dry		01	0	0		FT	0
RECUT/Recovery or rise, to the nearest min, of water in well after pumping or bailing well dry		01	0	0		MIN	0
* SCREN/Length, to the nearest 0.1 ft, of screen of an overburden well					0	FT	0
* STKUP/Length, to the nearest 0.1 ft, of PVC riser above ground surface		01	0	0		FT	0
SURF/Surface cover at well site		01	0	0	0	0	
TOPO/Topographic setting at well site		01	0	0	0	0	
WSTAT/Direct observation of well status		01	0	0	0	0	

COMMENTS (f): _____

(a)–Method used to complete action. Option codes located in Section 10.08 of User's Guide, Volume II, Data Dictionary (USATHAMA, 1991a).
(b)–Depth (to nearest 0.1 ft) from the topographic surface to the top of the interval for which the action or measurement was taken.
Option codes located in Section 10.03 of User's Guide, Volume II, Data Dictionary (USATHAMA, 1991a).
(c)–Thickness (to the nearest 0.1 ft) of the interval for which the action or measurement was taken.
Option codes located in Section 10.06 of User's Guide, Volume II, Data Dictionary (USATHAMA, 1991a).
(d)–The value associated with the method, unit of measure, and interval (when appropriate).
Option codes located in Section 10.10 of User's Guide, Volume II, Data Dictionary (USATHAMA, 1991a).
(e)–Code describing the result of the action or condition of the measurement.
Option codes located in Section 10.04 of User's Guide, Volume II, Data Dictionary (USATHAMA, 1991a).
(f)–Not entered into IROMIS system.
* Require data entry, other fields not required to be completed.

Figure 3-6

Well Construction and Development Data Form

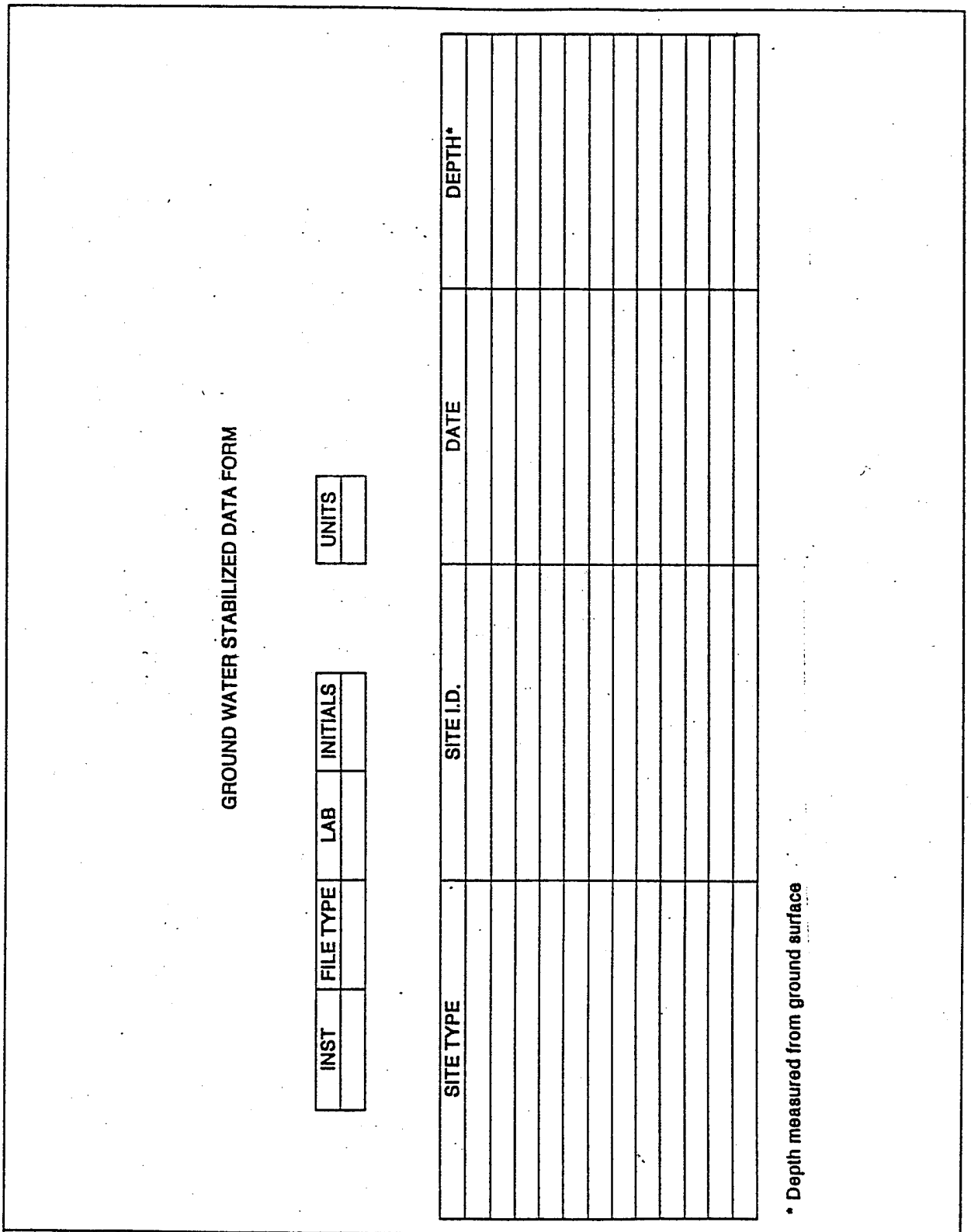


Figure 3-7

Ground Water Stabilization Form

Metcalf & Eddy

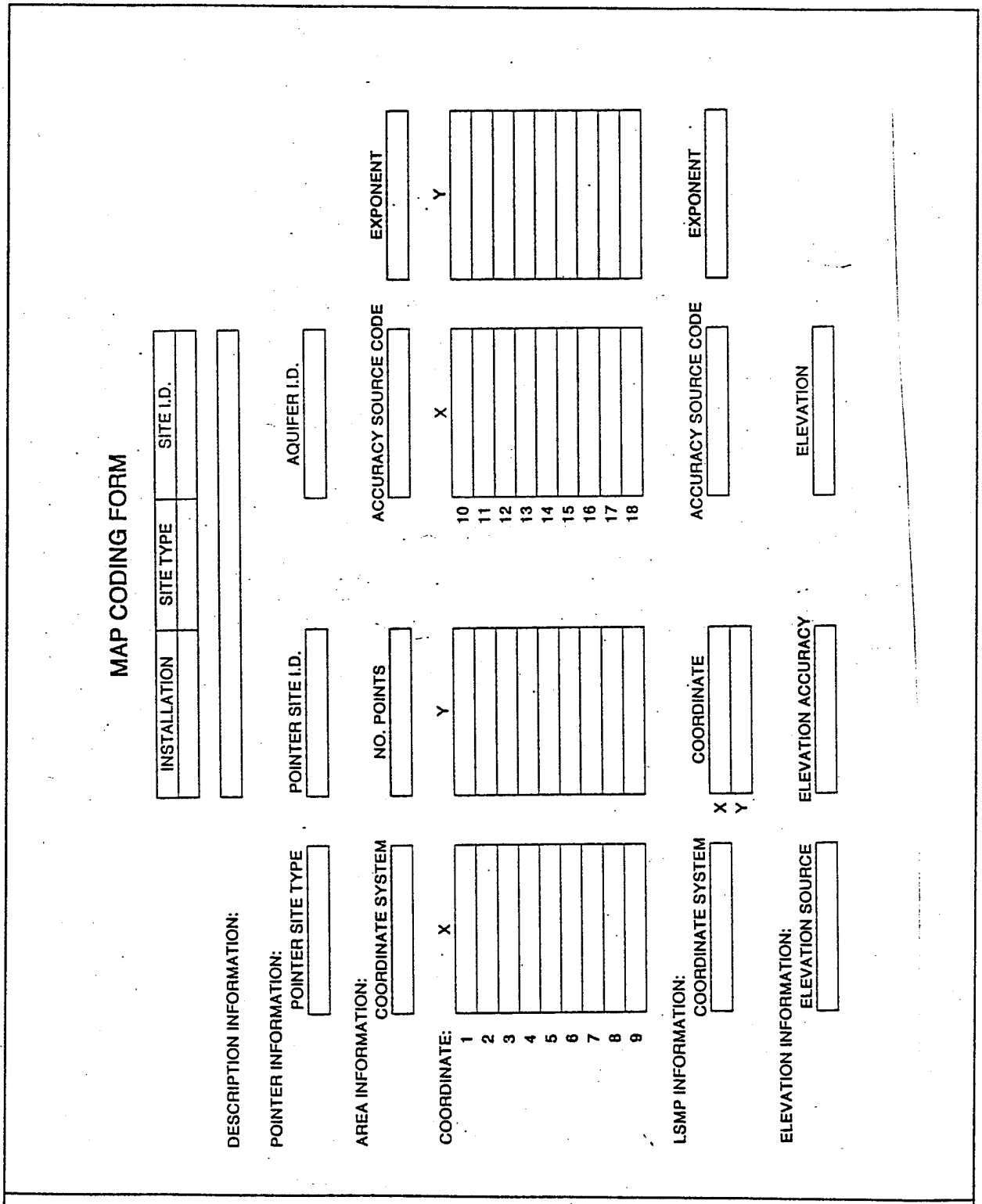


Figure 3-8

Map Coding Form

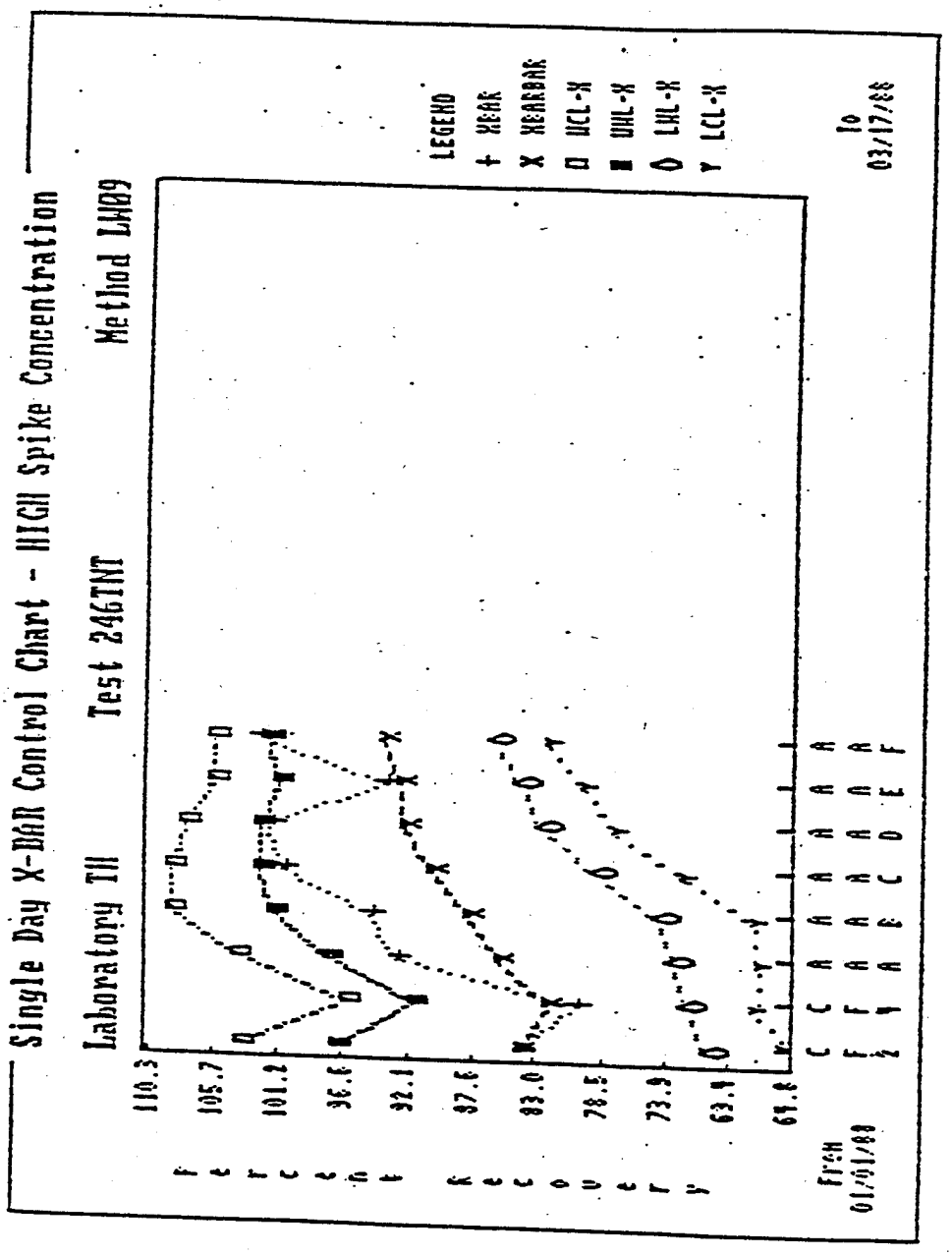


Figure 3-9

Example X-Bar Control Chart

Metcalf & Eddy

NONCONFORMANCE INCIDENT REPORT

NCR No. _____

Project: _____

Job No.: _____ Client: _____

Date of Report: _____ Prepared By: _____

Category of Nonconformance: Nonconformance Significant Incident

Stop Work? _____

DESCRIPTION OF NONCONFORMANCE/INCIDENT:

Location: _____

Date/Time of Occurrence: _____

Description:

Cause:

Disposition:

Disposition Approved By:

QA: _____ Project Management: _____ Other: _____

_____

Reference Corrective Action Report No.: _____

Reported to Client Representative: _____

Date Reported to Client: _____ By: _____

Figure 3-10

Nonconformance Incident Report

CORRECTIVE ACTION REPORT

Job No.: _____ Client: _____

Date of Report: _____ Prepared By: _____

Nonconformance Report No.: _____ Date of NCR: _____

Incident Report By: _____ Date Report: _____

Description of Cause:

Recommended Action to Prevent Recurrence:

Date Recommended Action to be Complete: _____

Action Recommended By: _____ Date: _____

Approved: _____ and _____

(Management/Date) (Quality Assurance/Date)

_____

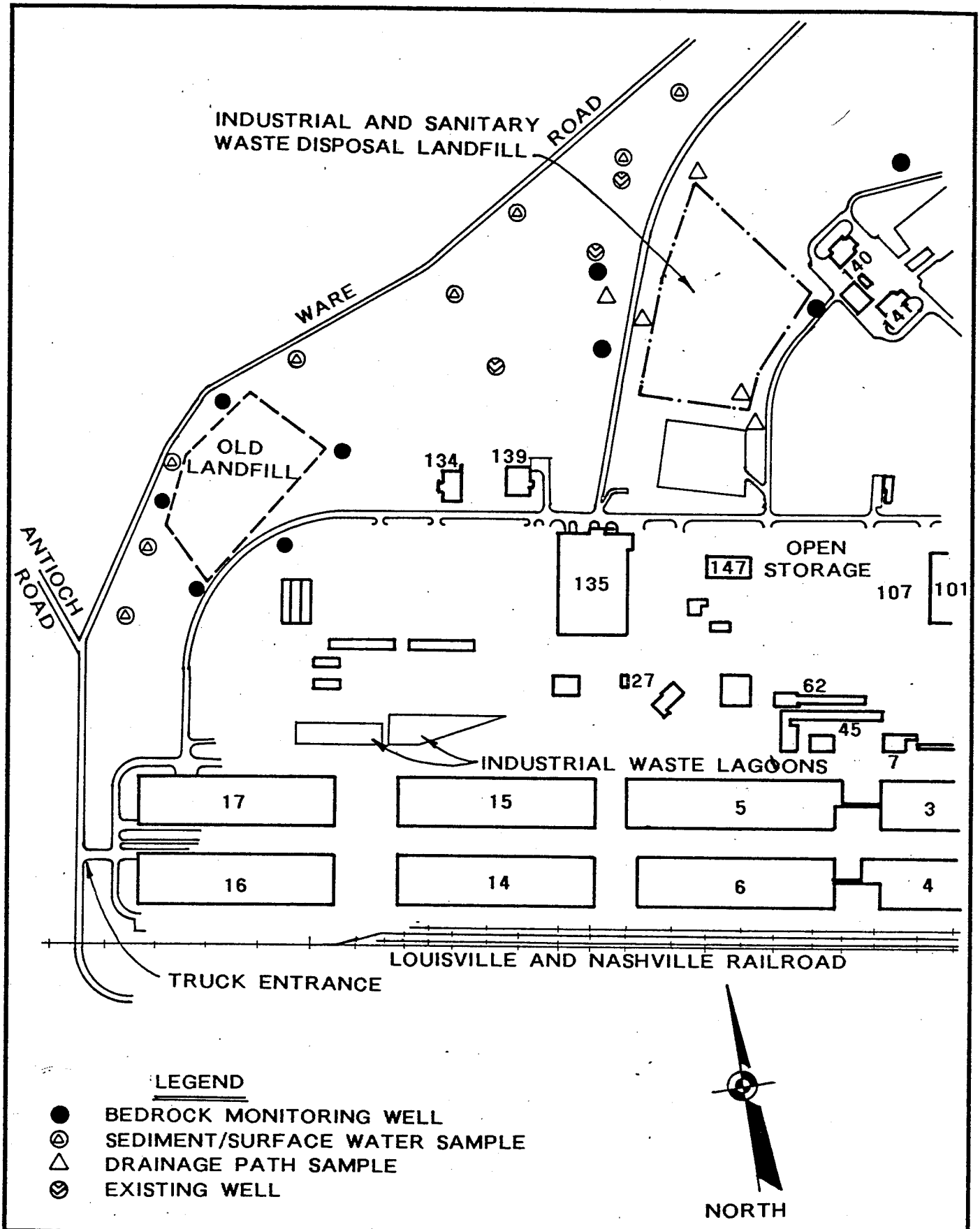
Corrective Action Sent to Client: Orally, Date ____ to Whom ____

Written, Date ____ to Whom ____

By: _____

Figure 3-11

Corrective Action Report



Metcalf & Eddy

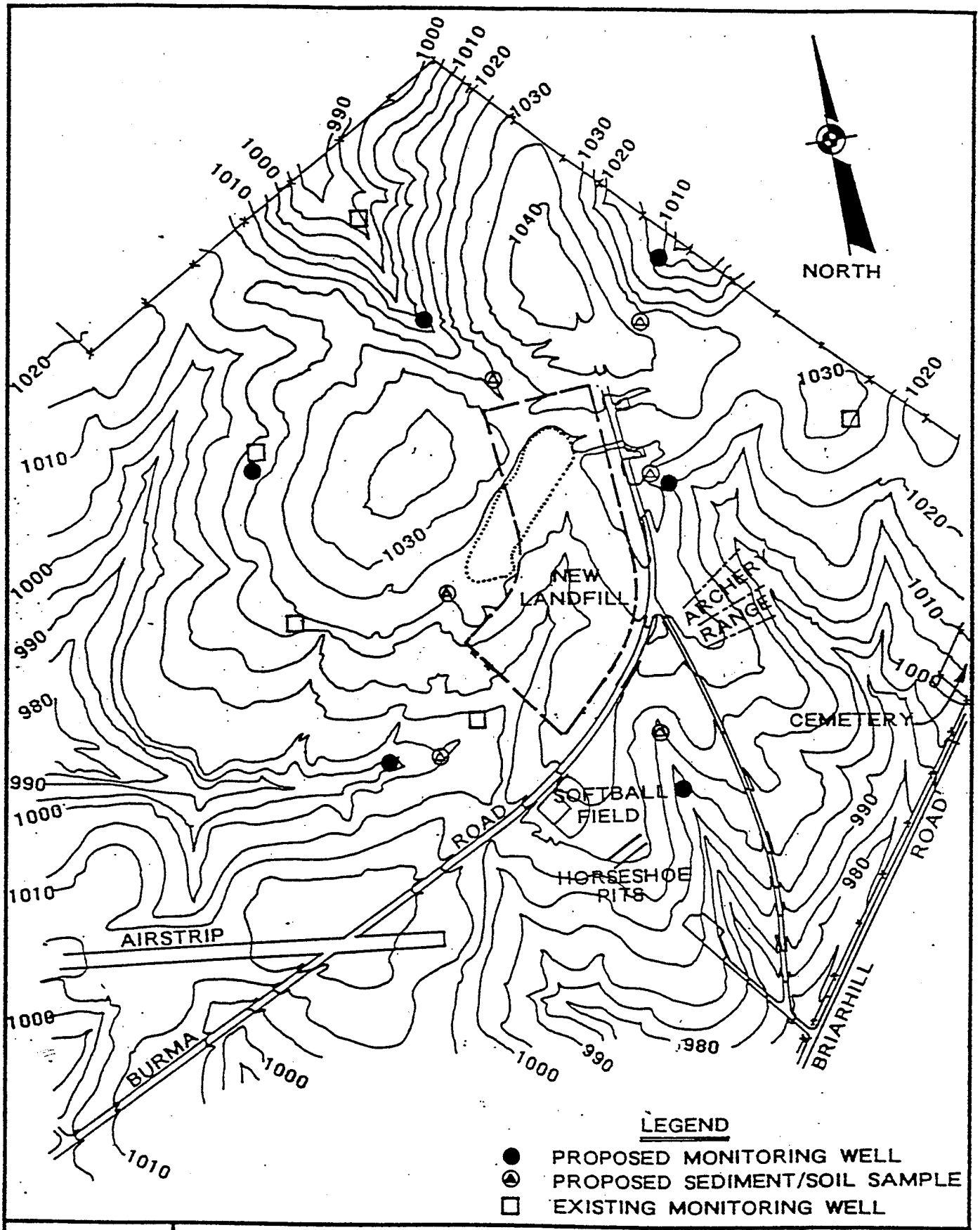
OLD LANDFILL AND INDUSTRIAL-SANITARY LANDFILL SAMPLING LOCATIONS

LEXINGTON FACILITY

LEXINGTON, KENTUCKY

Project Number 007248

Figure 4-1



Metcalf & Eddy

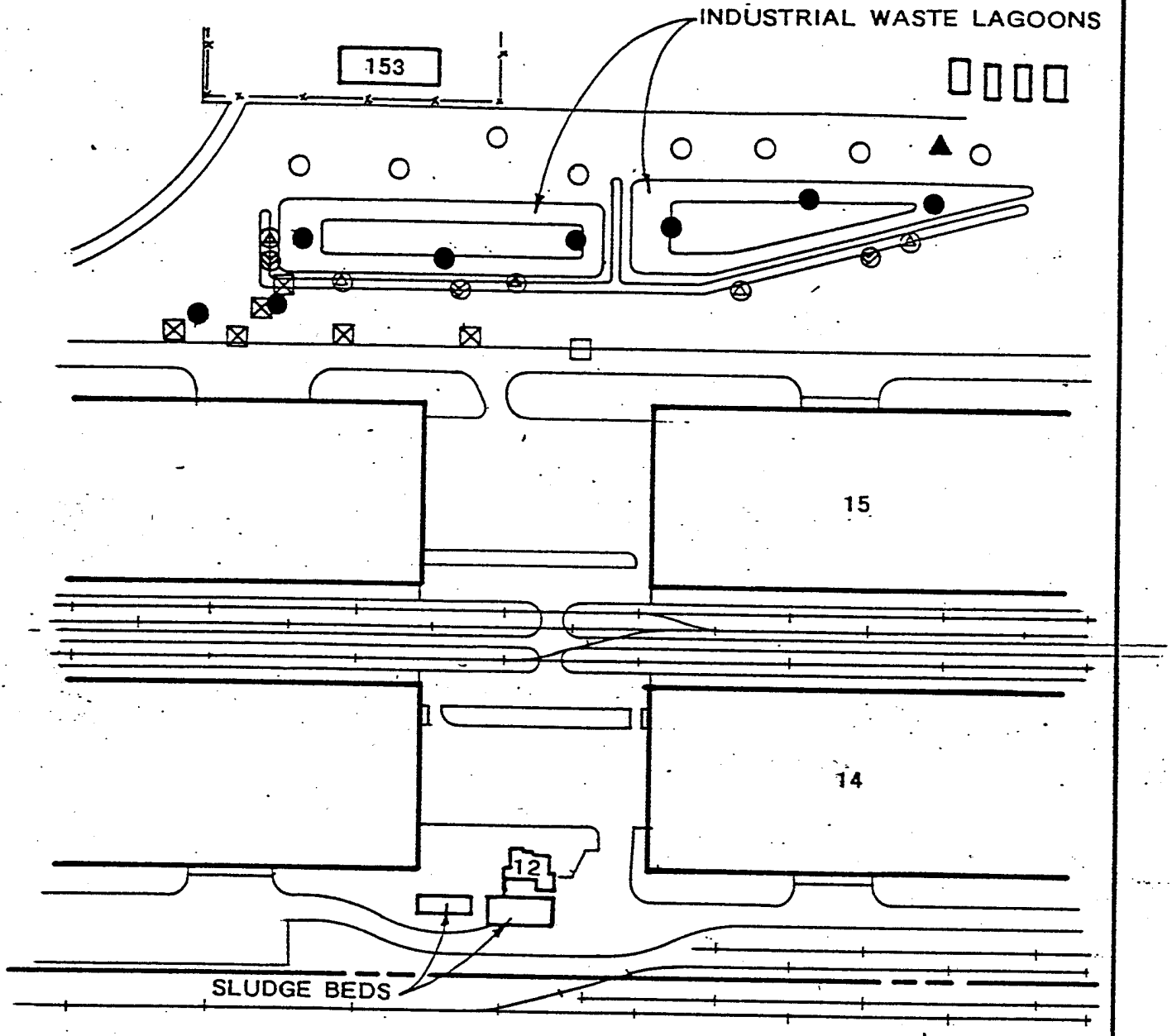
NEW LANDFILL SAMPLING LOCATIONS

LEXINGTON FACILITY

LEXINGTON, KENTUCKY

Project Number 007248

Figure 4-2



LEGEND

- SLUDGE BORINGS
- DEEP SOIL BORINGS
- HAND AUGER BORINGS
- SEDIMENT SAMPLES
- EXISTING MONITORING WELL
- SEEP
- PROPOSED MONITORING WELL

NORTH

Metcalf & Eddy

INDUSTRIAL WASTE LAGOON SAMPLING

LEXINGTON FACILITY

LEXINGTON, KENTUCKY

Project Number 007248

Figure 4-4